भारतीय मानक
Indian Standard

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कोयले से बने स्पंज लौहा के चार में चुम्बकत्व — ज्ञात करने की पद्धति

Magnetics in Char from Coal Based Sponge Iron (DRI) — Methods of Determination

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Sponge Iron and Smelting Reduction Sectional Committee, MTD 30

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Sponge Iron and Smelting Reduction Sectional Committee had been approved by the Metallurgical Engineering Division Council.

In rotary kilns based Direct Reduction Processes, non-magnetics/char is generated during the production of sponge iron. It is virtually impossible to separate out 100 percent of the magnetic sponge iron from non-magnetics /char even with the best type of magnetic separators. Some magnetic sponge iron finds its way into the non-magnetics thereby badly affecting the char quality, if the same is planned for use in boiler, besides resulting in loss of product. Hence, magnetics content in non-magnetics/char should be limited to within reasonable limits.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical value (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

MAGNETICS IN CHAR FROM COAL BASED SPONGE IRON (DRI) — METHODS OF DETERMINATION

1 SCOPE

This standard prescribes methods for determination of magnetics in char from coal based sponge iron (DRI).

2 REFERENCE

The following standard contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated was valid. All standards are subject to revisions, and parties to agreements based on this standards are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below:

IS No.	*Title*
1405 : 2010	Methods of sampling of iron ores (*third revision*)

3 EQUIPMENTS

3.1 Weighing Device, capacity of 50 kg.

3.2 Sampling Scoop, capacity of 2 kg.

3.3 Hand Magnet, size 100 × 150 mm with handle and 1 mm thick detachable stainless steel plate having magnetic strength in the range of 1 000 -1 200 Gauss.

3.4 Sample Container

4 DETERMINATION OF PERCENTAGE OF MAGNETICS IN CHAR

4.1 Sampling

4.1.1 A sample of non-magnetics/char on the conveyor after magnetic separation shall be collected by random sampling according to IS 1405. The minimum quantity of sample shall not be less than 20 kg.

4.2 Test Procedure

4.2.1 The sample collected as par random sampling method from the conveyor shall be weighed and the mass noted, say (Z).

4.2.2 In case the quantity is more than 20 kg, the quantity reductions shall be made by coning and quartering to 10 kg and if not, entire quantity shall be separated by magnet.

4.2.3 Magnetics are separated by using hand magnet touching the spread sample surface of thickness 25 mm maximum and repeated for 3 times maximum. The mass of the total magnetics weighed shall be noted, say (Y).

4.3 Calculation

$$\text{Percentage of magnetics from the sample} = \frac{Y}{Z} \times 100$$

5 DETERMINATION OF PERCENTAGE OF MAGNETICS IN CHAR STACK

5.1 Sampling

Random samples shall be collected from top, bottom and sides of the char stack. A minimum of 4 scoops from each part of the stack shall be collected combining the material from bottom to top. The sample thus collected shall be combined and gross sample prepared.

5.2 Test Procedure

5.2.1 If the sample quantity is more than 20 kg, weight reduction shall be made by coning and quartering principle and if not, the entire quantity of sample shall be separated by using hand magnet touching the spread sample surface of thickness 25 mm maximum and repeated for 3 times maximum.

5.2.2 The sample so collected in sample container as per **5.2.1** shall be weighed and mass noted, say (Z).

5.2.3 The magnetics separated after magnetic separation shall be weighed and mass noted, say (Y).

5.3 Calculation

$$\text{Percentage of magnetics from the sample} = \frac{Y}{Z} \times 100$$

5.4 Permissible Criteria

The magnetics reporting to non-magnetics/char shall be limited to a maximum of 2 percent (1 percent preferred) under standard raw material chemical and physical requirement (Fe content in iron ore $\geq$ 65 percent and average coal ash $\leq$ 30 percent) enumerated in various applicable standards pertaining to sponge iron. The magnetics classified as sponge iron with a

$Fe_{(m)}$ content ≥ 80 percent shall at the maximum, may constitute 10 percent of the total magnetics reporting to char.

5.4.1 However, with deteriorating iron ore and coal quality, maximum allowable magnetics reporting to char shall increase to a higher level. For every 1 percent decrease in Fe content in iron ore from a base of 65 percent, percent magnetics reporting to non-magnetics/char shall increase by 1 percent and for every 5 percent increase in avg, coal ash fed to the kiln from a base of 30 percent ash, percent magnetics reporting to non-magnetics/char shall further increase by 1 percent. Here also, the magnetics classified as sponge iron with a $Fe_{(m)}$ content ≥ 80 percent shall at the maximum, may constitute 10 percent of the total magnetics reporting to char.

For example, for iron ore having Fe content of 64 percent and average coal ash of 35 percent. The maximum allowable magnetics reporting to char shall be 1 percent and percentage $Fe_{(M)}$ should be ≤ 40.

NOTE — It may be necessary to further remove iron particles from char to make the latter suitable for use in AFBC boiler as per the requirement of boiler manufacturers. For this installation of a suitable magnetic separator upstream of boiler may be required.

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Amendments Issued Since Publication

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